

A NOVEL COOKED SAUSAGE AND A METHOD FOR
MAKING THE SAME

FIELD OF THE INVENTION

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The present invention relates to a novel cooked sausage and to a method for making the same. In particular, the invention relates to a cooked sausage comprising meat and a fermented milk product.

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BACKGROUND TO THE INVENTION

At the time of writing, there is a general consumer demand for meat and sausage products that are easier to digest and contain fewer calories than traditional meat sausages. Previous attempts have been made to meet this demand by providing reduced fat sausages which are widely perceived by consumers to be healthier than the traditional variety. To this end, sausages have been produced using meat that is as lean as possible. Poultry meat, for example, has been used increasingly in the production of sausages and other consumer meat products.

EP-A-0029503 (Stauffer Chemical Company Limited)
discloses an improved fermented sausage which

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comprises meat and a cultured dairy product. The cultured dairy product, which is preferably derived from whey and used dry, is cultured using traditional yogurt starter cultures comprising L. Bulgaricus and
5 S. Thermophilus until a final pH in the range of 4.2 to 4.3 is reached. On admixing the dairy product to a meat emulsion, a final product pH in the range of 4.5 to 4.8 is achieved, without requiring any further fermentation of the meat product. After stuffing, the
10 sausage is ripened, dried and/or smoked as required.

EP-A-0478526 (Vleeswarenfabrieken Imperial Naamloze Vennootschap) discloses a meat product, for example a sausage, comprising meat and a dairy product,
15 preferably curdled bactofugated milk, eg melted cheese or curd. EP-A-0478526 discloses that the dairy product is prepared by curdling the bactofugated milk using traditional cheese coagulating agents, such as rennet ferment or other proteolytic enzymes from
20 vegetable or microbial origin. The dairy product, on addition to the meat, has a pH in the range of 5.0 to 5.6. The mixture is then fermented further until a final pH of 4.6 to 5.2 is reached.

OBJECTS OF THE INVENTION

An object of the present invention is to provide a novel meat product. In particular, it is an object of the present invention to provide a novel cooked
5 sausage.

Another object of the present invention is to provide a cooked sausage that will be perceived by consumers to be healthy to eat, and which comprises fewer
10 calories than traditional meat sausages.

Yet another object of the present invention is to provide an improved cooked sausage comprising meat and a fermented dairy product.
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SUMMARY OF THE INVENTION

According to one aspect of the present invention there is provided a cooked sausage comprising a mixture of a meat emulsion and a fermented milk product having a pH
20 of at least about 4.6, wherein said fermented milk product is substantially homogeneously dispersed throughout the meat emulsion and said mixture has a pH of about 5.5 or more.

In a different aspect of the present invention, there is provided a method of making a cooked sausage which comprises forming a mixture of a meat emulsion and a fermented milk product having a pH of at least about 4.6, in which mixture said fermented milk product is substantially homogeneously dispersed through the emulsion, forming the mixture into a sausage, and thereafter cooking the sausage; wherein the pH and proportion of the fermented milk product in the mixture is such that the pH of the mixture is 5.5 or more.

Said fermented milk product may comprise one or more products selected from mild yogurt, buttermilk, soured cream milk, soured milk, fresh cheese, fermented whey and kefir.

The term "soured cream milk" as used herein includes soured cream, sauerrahm, schmand and creme fraiche.

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The term "soured milk" includes sauermilch and dickmilch.

The term "fresh cheese" includes frischkäse, quark and cottage cheese.

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Preferably the fermented milk product has a pH of about 4.8 or more, more preferably about 5.2 or more.

Said meat emulsion may comprise red meat such, for example, as beef, lamb or pork, or poultry such, for example, as turkey or chicken. Such meat has a pH of about 6.0 to 6.2 and an isoelectric point of about pH 5.0 to about 5.2. In order to provide a boiled sausage that is juicy and has a desirable texture, it has been found that it is essential to keep the pH of the mixture of meat emulsion and fermented milk product at about pH 5.5 or more. If the pH of the mixture falls below pH 5.5 towards the isoelectric point of the meat, the water-retaining capacity of the meat is reduced, with the result that the juiciness and texture of the final product is impaired.

In a particularly preferred embodiment of the invention, said fermented milk product comprises mild yogurt. Normal yogurt has a pH of about 3.6 to 5.1, typically about 4.6. It will be appreciated therefore that if such a yogurt is mixed with a meat emulsion, the pH of the resultant mixture may have a pH less than 5.5. A mild yogurt in accordance with the present invention may comprise yogurt that is prepared

in the traditional manner, but is used in the process of the invention before fermentation is fully completed. Thus, after inoculation of the milk mixture, the pH of the yogurt is monitored until it
5 reaches the desired value. The mild yogurt is then made ready for use in the method of the present invention. In some embodiments, fermentation of the yogurt may be quenched by cooling the yogurt to a temperature in the range of -2 to 6°C, preferably 0 to
10 6°C. Preferably, the yogurt is cooled rapidly using liquid nitrogen or a plate-heat-exchanger.

In order to assist in controlling accurately the pH of the yogurt to be added to the meat emulsion, slow-
15 working yogurt starter cultures are preferably used. Such slow working yogurt cultures may comprise Lactobacillus acidophilus, Bifidobacteria and Streptococcus thermophilus. Further, the yogurt is preferably stirred continuously before use to allow
20 accurate pH control.

In accordance with the invention, buttermilk may be made from the residual milk that remains after conventional butter-churning, that is separation of
25 the milk-fat (butter) from the remaining milk

substances. Said residual milk may be soured using suitable, preferably slow-working, starter cultures such as *lactococcus lactis* subsp. *cremoris*, *lactococcus lactis* subsp. *lactis*, *Leuconostoc*
5 *mesenteroides* subsp. *cremoris* and/or *lactococcus lactis* subsp. *diacetylactis* until a pH of about 4.8 or more is reached. Alternatively said buttermilk may be made by first souring whole milk to a desired pH with suitable starter cultures, and then quenching
10 fermentation and churning to separate the buttermilk from the milk-fat (butter).

Said soured creamed milk in accordance with the invention may be made by souring whole milk with a
15 high fat content using suitable starter cultures such as *lactococcus lactis* subsp. *cremoris*, *lactococcus lactis* subsp. *lactis* and/or *leuconostoc mesenteroides* subsp. *cremoris* to a desired pH of 4.8 or more.

20 Soured milk, including curd milk, may be made by fermenting whole milk having a normal fat content using starter cultures such, for example as *lactococcus lactis* subsp. *cremoris*, *lactococcus lactis* subsp. *lactis* and/or *leuconostoc mesenteroides* subsp.
25 *cremoris*.

Said fresh cheese may be made in the conventional manner by fermenting whole milk using suitable cheese starter cultures such as *lactococcus lactis* subsp. *cremoris*, *lactococcus lactis* subsp. *lactis* and/or *leuconostoc mesenteroides* subsp. *cremoris* in the presence of a curdling enzyme such, for example, as rennet. Once the desired pH is reached, the fermentation may be quenched and the cheese allowed to set. Once the mass has set, the cheese may be crushed mechanically and the solid cheese component extracted from the remaining liquid whey. The consistency of the cheese may be adjusted as desired by centrifugation, straining and/or the addition of cream. For quark, starter cultures such as *lactobacillus acidophilus*, *lactococcus lactis* subsp. *cremoris*, *lactococcus lactis* subsp. *lactis*, *leuconostoc mesenteroides* subsp. *cremoris* and *bifidobacter* may be used.

The remaining whey may also be used in accordance with the present invention when it has a pH of 4.8 or more.

Where the fermented milk product of the present invention comprises two or more different components, it is not necessary that each component has an

individual pH or 4.6 or more, only that the overall pH of the fermented milk product is 4.6 or more, preferably 4.8 or more, and in some embodiments 5.1 or more.

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In some embodiments, said fermented milk product may comprise an edible, alkaline additive to neutralize the acidity of the product. Said alkaline additive may comprise, for example, carbonated soda and/or ammonium carbonate. Alkaline phosphates and/or citrates could also be used to stabilize the mixture.

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In some embodiments, the fermented milk product may be used in dried or freeze-dried form.

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Said mixture may comprise 60 to 90% by weight of said meat emulsion.

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Said mixture may comprise 10 to 40% by weight of the fermented milk product, preferably 15 to 35% by weight. Typically, the mixture may comprise about 24 to 26% by weight of mild yogurt, e.g. 25% wt.

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Said mixture may further comprise 0-10% by weight of various spices or other additives. In a particularly

preferred embodiment of the invention, said mixture may comprise up to 10% of a pre-biotic additive such as a non-digestible carbohydrate. An example of a pre-biotic carbohydrate is inulin. Said mixture may
5 comprise 2-7% wt inulin, which selectively promotes the activity of some health-promoting bacteria in the colon.

Said mixture of meat and fermented milk product may be
10 formed into sausages in any suitable manner to those skilled in the art, including moulding and extrusion. Preferably, the meat/milk mixture is extruded through a stuffing horn into a flexible sausage casing of the kind well known to those skilled in the art. However,
15 it is also envisaged that the boiled sausage in accordance with the present invention may be formed by moulding and then forming a skin in situ by treating the surface of the sausage with a suitable acid so as to cause coagulation of the surface layer of meat.

20 Said meat emulsion preferably comprises an emulsion of finely comminuted meat. Said meat emulsion may be formed by comminuting whole muscle, ground, minced or mechanically separated meat. The meat may be used
25 fresh or frozen. Said meat is preferably finely

comminuted in the presence of said yogurt to form an emulsion having a soft, homogeneous consistency. In some embodiments the emulsion may further comprise coarsely ground meat, which may be substantially
5 uniformly dispersed through the emulsion.

Preferably, the fermented milk product is added to the meat during comminution in small portions or continuously, for example, with the aid of pumping
10 equipment. It is preferable to ensure that the pH of the milk/meat mixture does not fall below about pH 5.5, even transiently, during mixing of the fermented milk with the meat. At the same time, it is
preferable to ensure that the pH of the fermented milk
15 product is not increased too much by the meat, such that the characteristic aroma of the fermented milk is lost particularly where yogurt is used.

An advantage of the present invention is that by
20 adding a cooled, fermented milk product at a temperature of 0 to 6°C to the meat emulsion, the normal addition of cooled water to meat emulsions for sausage manufacture can be reduced or dispensed with altogether. Such cooled water is normally added to
25 maintain the temperature of the emulsion below about

12°C during comminution and subsequent extrusion, and also to bind with the meat emulsion to cause the product to swell. Of course, some fermented milk products contain a substantial proportion of water, and in accordance with the present invention, this water can be used to replace the additional water that is normally added during sausage manufacture.

Preferably the meat is chilled prior to admixture of the fermented milk product to a temperature in the range 0 to 8°C.

Finally, the sausage is cooked. Said sausage may be boiled. By "boiled" here is meant heating the sausage in any suitable, edible fluid, preferably water, at a temperature and for a time sufficient to cook the meat. In some embodiments the sausage may be steamed. Preferably the sausage is boiled at a temperature in the range 60 to 80°C, more preferably in the range of 70 to 75°C, eg 72°C. Alternatively, the sausage may be cooked in hot air and/or hot smoke. Preferably, the sausage is cooked at a sufficient temperature to kill the fermentation cultures, so as to prevent further fermentation of the milk in the finished product.

Thus, the present invention provides a novel cooked sausage containing meat and a fermented milk product and also a method for manufacturing this product. The cooked sausage of the invention is relatively high in protein, but contains reduced fat as compared with a conventional meat sausage. The fermented milk product, particularly yogurt, adds a distinctive flavour and aroma to the product. The pH of yogurt when added to the meat emulsion is sufficient low that the yogurt has the characteristic flavour and aroma of normal yogurt, but is not so low as to reduce the pH of the meat/yogurt mixture below about pH 5.5, so that the emulsion retains its water binding properties to ensure that a sausage is produced that is desirably juicy and has attractive organoleptic quality.

Following is a description by way of example only with reference to the accompanying drawings of methods occurred in the present invention into effect.

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BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A is a schematic, isometric view of a cooked sausage in accordance with the present invention.

25 Figure 1B is a schematic, isometric view of a slice of

a cooked sausage in accordance with the present invention.

Figure 2 shows a flow diagram for manufacturing a
5 boiled sausage in accordance with the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

With reference to Figures 1A and 1B, a boiled sausage, such as a frankfurter, in accordance with the
10 invention has a normal sausage shape and comprises an edible sausage material 10 that is stuffed into a conventional sausage casing 12. Said sausage material 10 comprises a finely comminuted meat emulsion 14 and a coarse component 16 that is substantially uniformly
15 dispersed through the emulsion 14. Said coarse component comprises coarsely ground pieces of meat and optional seasonings such, for example, as whole or coarsely ground peppercorns. In some embodiments, the coarse portion may be omitted.

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Said finely comminuted meat emulsion 14 comprises a mixture of meat and a fermented milk product which are substantially homogeneously blended together to form an emulsion. The meat pieces of the coarse component
25 16 may also be tumbled with a fermented milk product.

EXAMPLES

Example 1

- 5 A specific example of a turkey putenjagdwurst with yogurt is made according to the following recipe:-

Finely Comminuted Meat Emulsion

	Turkey thigh meat	10.0%
10	Turkey white trim	20.5%
	Turkey dark trim	20.5%
	Chicken trim	14.2%
	Yogurt	25.1%
	Spices	9.7%
15		100%

Dry Ingredients for Meat Emulsion

	I. Curing salt	1.39%
	sodium citric	0.56%
20	II. Ground mustard seed	0.8%
	lactose	0.6%

	III. Super Pök (ascorbate, sugar)	0.25%
	Senator (spicemix Raps)	0.57%
	Green Pepper (Raps)	0.16%
5	Glutalin (Raps) (flavourenhancer)	0.19%
	HVP (hydrolysed vegetable protein)	0.19%
	IV. Inulin (Frutafit)	4.9%
	V. Liquid onion (Raps)	0.09%
	liquid garlic (Raps)	0.03%
10		9.73%

Coarse Component

	Turkey thigh meat	66.2%
	Yogurt	24.8%
	Spices	9.0%
5		100%

The coarse component is ground through a 13mm plate.

Spices for Coarse Component

10	I. Curing salt	1.85%
	sodium citric	0.56%
	II. Inulin (Frutafit)	3.1%
	III. Super Pök (ascorbate, sugar)	0.12%
15	Green Pepper (Raps)	0.12%
	Glutalin (Raps)	0.26%
	IV. Spice-mix Schinkenwurstgewürz (Wolf)	0.70%
20	Senator (Raps)	0.44%

V. Garlic, liquid (Raps)	0.22%
fresh onion, liquid (Raps)	0.27%
VI. Green pepper corns	1.35%
	8.99%

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The yogurt for addition to the meat emulsion and coarse
 component is manufactured in the traditional way using
 milk that is clarified and separated into cream and
 10 skimmed milk, and then standardised to achieve a
 desired fat content. The desired proportions of cream
 and skimmed milk are then blended together, and the
 mixture is pasteurised and then homogenised. The
 homogenised mixture is cooled to a temperature in the
 15 range of about 30 to about 50°C and then inoculated with
 a slow working yogurt starter culture comprising
Streptococcus thermophilus, Lactobacillus acidophilus
 and Bifidobacteria. The mixture is then allowed to
 ferment for about four to six hours at 30 to 50°C,
 20 typically about 43°C, such that the mixture coagulates
 to form yogurt. As shown in Figure 2, the pH of the
 mixture is carefully monitored. When the pH of the
 yogurt reaches a target pH of about 5.1 to 5.2,

the yogurt is stirred to allow accurate determination of the pH. Such stirring also has the effect of an arresting fermentation. When a target pH of 4.8 or more is reached, the yogurt is subjected to shock
5 freezing to a temperature of about -1°C . At this temperature, further fermentation of the yogurt is prevented. For such shock freezing, liquid nitrogen or a plate-heat-exchanger may be used.

10 In view of the need to control accurately the pH of the yogurt used in the process of the invention, it is desirable that the yogurt is made at the same site as sausage manufacture takes place, but it is envisaged that alternatively yogurt supplied from a nearby dairy
15 may be used.

The chilled yogurt is then divided into two separate portions. A first portion is weighed for addition to the coarse component 16 of the sausage material 10.
20 At the weighing stage, the additional spices and additives are added to the yogurt. Said coarse component is then tumbled with the yogurt for about two hours and is then ground.

A second portion of the yogurt is added in small batches to minced meat having a temperature of about 0°C. Said minced meat is then finely comminuted with the yogurt to form an emulsion, and the yogurt assists
5 in maintaining the temperature of the meat emulsion below about 12°C. The additional spices and additives are added to the meat emulsion during comminution.

43% Wt of the coarse component is then mixed with 57%
10 wt of the comminuted meat emulsion, such that the coarse component is substantially uniformly dispersed throughout the finely comminuted meat emulsion. The mixture is then stuffed into sausage casings using a stuffing horn of the kind well know to those skilled
15 in the art. The resulting sausages are boiled at a temperature of about 72°C in the water and then showered, cooled, packed and labelled in the conventional manner.

20 The total amount of yogurt added to the sausage material is calculated such that the overall pH of the sausage material does not fall below about pH 5.5. In this way, the sausage material retains its ability to the bind water, so that a desirable juicy product is
25 produced. At the same time, the yogurt having a

target pH of about 4.8 or more has an acceptable yogurt flavour and aroma.

Example 2

- 5 A specific example of a pork meat putenjagdwurst with yogurt is prepared using the method described above in Example 1 as follows:-

Finely Comminuted Meat Emulsion

10	Lean pork trimmings	32.1%
	Pork shin meat	20.5%
	Pork neck fat	15.2%
	Yogurt	25.1%
	Spices	7.1%
15		100%

The emulsion is made in a bowl-chopper. Yogurt is added in small quantities.

Dry Ingredients for Emulsion

	I. Curing salt	1.39%
	sodium citric	0.56%
	II. Ground mustard seed	2.72%
5	lactose	0.9%
	III. Super Pök (ascorbate, sugar)	0.25%
	Senator (Spicemix Raps)	0.56%
	Green Pepper (Raps)	0.16%
10	glutalin (raps) (flavour enhancer)	0.19%
	HVP (hydrolysed vegetable protein)	0.19%
	IV. liquid onion (Raps)	0.09%
	liquid garlic (Raps)	0.03%
		7.04%
15	Coarse Meat Component	
	Pork shoulder 90VL	67.9%
	Yogurt	24.8%
	Spices	7.3%
		100%

The coarse component is ground through a 13mm plate.

Spices for Coarse Component

	I. Curing salt	1.85%
	sodium citric	0.56%
	II. lactose	0.5%
5	ground mustard seed	0.98%
	III. Super Pök (ascorbate, sugar)	0.12%
	Green Pepper (Raps)	0.12%
	Glutalin (Raps)	0.26%
10	IV. Spicemix Schinkenwurstgewürz (Wolf)	0.70%
	Senator (Raps)	0.44%
	V. Garlic, liquid (Raps)	0.22%
15	fresh onion, liquid (Raps)	0.27%
	VI. Green pepper corns	1.35%
		7.30%

At the final mixing stage, 57% by weight of the finely comminuted pork meat emulsion is mixed with 43% weight of the coarse meat portion.

5 Example 3

A frankfurter with cottage cheese and frischkäse is made according to the following recipe:

Spices for Coarse Component

10	Port trimmings SOVL	40.0%
	Turkey white trim	10.0%
	Chicken trim	5.0%
	Water/ice	8.45%
	Cottage cheese, pH = 4.7	20.0%
15	Fresh cheese, pH = 4.8 - 4.9	10.0%
	Spices	6.55%
		100%

Spice mix for meat emulsion

20	Curing salt	1.5%
	Sodium citrate	0.8%

	Lactose	1.2%
	Ground mustard seed	1.2%
	Sodium ascorbate	0.05%
	Matador (Spice mix Raps)	1.1%
5	Hydrolysed vegetable protein	0.3%
	Liquid onion	0.2%
	Liquid garlic	0.2%
		6.55%

10 The cottage cheese and fresh cheese are made by conventional processes comprising fermenting milk using a cheese soured culture in the presence of a curdling enzyme such, for example, as rennet. As starter cultures may be used *lactococcus lactis* subsp. cremoris, *lactococcus lactis* subsp. *lactis* and/or

15 *leuconostoc mesenteroides* subsp. *cremoris*. As with the milk yogurt of Examples 1 and 2 above, the pH of the cheese is monitored as fermentation proceeds until the desired, final pH is reached, when fermentation is

20 arrested. Once the cheese has set, it is mechanically crushed, and the solid cheese component is separated from the whey residue. The consistency of the cheese

can be adjusted by centrifuging, straining and/or the addition of cream.

The cheese is then mixed with the other ingredients at
5 a temperature of about 0°C and finely comminuted in a
bowl chopper to form an emulsion. The emulsion is
then stuffed into shirred sausage casings using a
stuffing horn, and the resulting frankfurters are
boiled in water at a temperature of about 72°C,
10 showered, cooled, packed and labelled.